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**EN 81 : Part 1 : 1985**

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# Lifts and service lifts

## Part 1. Safety rules for the construction and installation of electric lifts

[EN title: Safety rules for the construction and installation of lifts and service lifts – Part 1: Electric lifts]

Ascenseurs et monte-charge

Partie 1. Règles de sécurité pour la construction et l'installation des ascenseurs électriques

Personen- und Lastenaufzüge sowie Kleingüteraufzüge

Teil 1. Sicherheitsregeln für die Konstruktion und den Einbau von elektrisch betriebenen Aufzügen

This European Standard EN 81 : Part 1 has the status of a British Standard.

passenger (passager) (Fahrgast). Any person transported by a lift.

pit (cuvette) (Schachtgrube). The part of the well situated below the lowest landing level served by the car.

positive drive lift (includes drum drive) (ascenseur à treuil attelé) (Trammelauzug, Kettenaufzug). A lift suspended by chains or lifting ropes driven by means other than friction.

positive drive service lift (includes drum drive) (monte-charge à treuil attelé) (Trammelauzug/Kettenkleingüteraufzug). A service lift suspended by chains, or ropes driven by means other than friction.

progressive safety gear (parachute à prise amortie) (Bremsfangvorrichtung). A safety gear in which deceleration is effected by a braking action on the guides and for which special provisions are made so as to limit the forces on the car or counterweight to a permissible value.

pulley room (local des poulies) (Rollerraum). A room not containing the machine, and in which pulleys are located and in which the overspeed governors and the electrical equipment may also be housed.

rated load (charge nominale) (Nennlast). The load for which the equipment has been built and for which normal operation is guaranteed by the vendor.

rated speed (vitesse nominale) (Nenngeschwindigkeit). The speed of the car for which the equipment has been built and for which normal operation is guaranteed by the vendor.

re-levelling (isonivelage) (Nachstellung). An operation, after the lift has stopped, to permit the stopping position to be corrected during loading or unloading, if necessary by successive movements (automatic or inching).

safety gear (parachute) (Fangvorrichtung). A mechanical drive for stopping, and maintaining stationary on the guides, the lift car or counterweight in case of overspeeding in the downward direction or braking of the suspension.

safety rope (câble de sécurité) (Sicherheitsseil). An auxiliary rope attached to the car and the counterweight for the purpose of tripping a safety gear in case of suspension failure.

service lift (monte-charge) (Kleingüteraufzug). A permanent lifting equipment serving defined landing levels, comprising a car, the interior of which is *inaccessible to persons* on account of its dimensions and means of construction, running at least partially between rigid vertical guides or guides whose inclination to the vertical is less than 15°.

To satisfy the condition of inaccessibility, the car dimensions do not exceed:

- (a) floor area 1.00 m<sup>2</sup>;
- (b) depth 1.00 m;
- (c) height 1.20 m.

A height greater than 1.20 m is permissible, however, if the car comprises several permanent compartments, each of which satisfies the above requirements.

sling (étrier) (Rahmen). The metal framework carrying the car or counterweight, connected to the means of suspension. This sling may be integral with the car enclosure.

toe guard (garde-pieds) (Schürze). An apron having a smooth vertical part extending downwards from the sill of the landing or car entrance.

traction drive lift (ascenseur à adhérence) (Treibeiseilbahn-Aufzug). A lift whose lifting ropes are driven by friction in the grooves of the driving sheave of the machine.

traction drive service lift (monte-charge à adhérence) (Treibeiseilbahn-Kleingüteraufzug). A service lift whose lifting ropes are driven by friction in the grooves of the driving sheave of the machine.

unlocking zone (zone de déverrouillage) (Entriegelungszone). A zone, extending above and below the stopping level, in which the car floor must be to enable the corresponding landing door to be unlocked.

user (usager) (Benutzer). Person making use of the services of a lift installation.

well (gaine) (Schacht). The space in which the car and the counterweight, if there is one, travels. This space is bounded by the bottom of the pit, the walls and the roof of the well.

#### 4. Symbols and abbreviations

4.1 Units. The units used are chosen from the International (SI) System of units.

##### 4.2 Symbols

Measurements (in the order they appear in the document)	Symbol	Unit
Rated speed	$v$	m/s
Sum of the mass of the empty car and the masses of the portion of the travelling cables and any compensation devices, suspended from the car	$P$	kg
Rated load (mass)	$Q$	kg
Ratio between the greater and the smaller static force in the parts of the rope located on either side of the traction sheave	$\frac{T_1}{T_2}$	(1)
Coefficient taking account of the acceleration, deceleration and specific conditions of the installation	$C_1$	(1)
Standard acceleration of free fall	$g_n$	m/s <sup>2</sup>
Braking deceleration of the car	$a$	m/s <sup>2</sup>
Coefficient taking account of the variation in profile of the traction sheave groove due to wear	$C_2$	(1)
Base of natural logarithms	$e$	(1)
Coefficient of friction of ropes in traction sheave grooves	$f$	(1)
Coefficient of friction between steel wire ropes and sheaves	$\mu$	(1)
Angle of wrap of the ropes on the traction sheave	$\alpha$	rad
Angle of the undercut grooves or semi-circular grooves in the traction sheave	$\beta$	rad
Angle of the vee grooves in the traction sheave	$\gamma$	rad
Diameter of traction ropes	$d$	mm
Diameter of traction sheave	$D$	mm
Number of ropes	$n$	(1)
Specific pressure of the ropes in the traction sheave grooves	$p$	N/mm <sup>2</sup>
Static force in the ropes to the car at the level of the traction sheave when the car is stationary at the lowest level with its rated load	$T$	N
Speed of the ropes corresponding to the rated speed of the car	$v_0$	m/s

**guide rails (guides) (Führungsschienen)** : The rigid components which provide guiding for the car, the counterweight or the balancing weight.

**headroom (partie supérieure de la gaine) (Schachtkopf)** : Part of the well between the highest landing served by the car and the ceiling of the well.

**instantaneous safety gear (parachute à prise instantanée) (Sperrfangvorrichtung)** : A safety gear in which the full gripping action on the guide rails is almost immediate.

**instantaneous safety gear with buffered effect (parachute à prise instantanée avec effet amorti) (Sperrfangvorrichtung mit Dämpfung)** : A safety gear in which the full gripping action on the guide rails is almost immediate, but the reaction on the car, counterweight or balancing weight is limited by presence of an intermediate buffering system.

**laminated glass (verre feuilleté) (Verbundsicherheitsglas VSG)** : An assembly of 2 or more glass layers, each of which is bonded together using a plastic film.

**levelling (niveleage) (Einfahren)** : An operation which improves the accuracy of stopping at landings.

**lift machine (machine) (Triebwerk)** : The unit including the motor which drives and stops the lift.

**machine room (local de machines) (Triebwerksraum)** : A room in which machine or machines and/or the associated equipment are placed.

**minimum breaking load of a rope (charge de rupture minimale d'un câble) (Mindestbruchkraft eines Seiles)** : The product of the square of the nominal diameter of the rope (in square millimetres) and the nominal tensile strength of the wires (in newtons per square millimetre) and a coefficient appropriate to the type of rope construction.

**overspeed governor (limiteur de vitesse) (Geschwindigkeitsbegrenzer)** : A device which, when the lift attains a predetermined speed, causes the lift to stop, and if necessary causes the safety gear to be applied.

**passenger (passager) (Fahrgast)** : Any person transported by a lift in the car.

**pit (cuvette) (Schachtgrube)** : The part of the well situated below the lowest landing served by the car.

**positive drive lift (includes drum drive) (ascenseur à treuil attelé) (Trommelaufzug, Kettenaufzug)** : A lift suspended by chains or ropes driven by means other than friction.

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**progressive safety gear** (*parachute à prise amortie*) (*Bremsfangvorrichtung*) : A safety gear in which retardation is effected by a braking action on the guide rails and for which special provisions are made so as to limit the forces on the car, counterweight or balancing weight to a permissible value.

**pulley room** (*local de poulies*) (*Rollenraum*) : A room not containing the machine, in which pulleys are located, and in which the overspeed governor and the electrical equipment can also be housed.

**rated load** (*charge nominale*) (*Nennlast*) : The load for which the equipment has been built.

**rated speed** (*vitesse nominale*) (*Nenngeschwindigkeit*) : The speed  $v$  in metres per second of the car for which the equipment has been built.

**re-levelling** (*isonivelage*) (*Nachstellen*) : An operation, after the lift has stopped, to permit the stopping position to be corrected during loading or unloading, if necessary by successive movements (automatic or inching).

**safety gear** (*parachute*) (*Fangvorrichtung*) : A mechanical device for stopping, and maintaining stationary on the guide rails, the lift car, counterweight or balancing weight in case of overspeeding or breaking of the suspension.

**safety rope** (*câble de sécurité*) (*Sicherheitsseil*) : An auxiliary rope attached to the car, the counterweight or balancing weight for the purpose of tripping a safety gear in case of suspension failure.

**sling** (*ébrier*) (*Rahmen*) : The metal framework carrying the car, counterweight or balancing weight, connected to the means of suspension. This sling can be integral with the car enclosure.

[ **traction drive lift** (*ascenseur à adhérence*) (*Tröbscheiben-Aufzug*) : A lift whose lifting ropes are driven by friction in the grooves of the driving sheave of the machine.

**travelling cable** (*câble pendentif*) (*Hängeseil*) : Flexible cable between the car and a fixed point.

**unlocking zone** (*zone de déverrouillage*) (*Entriegelungszone*) : A zone, extending above and below the stopping level, in which the car floor must be to enable the corresponding landing door to be unlocked.

**user** (*usager*) (*Benutzer*) : Person making use of the services of a lift installation.

**well** (*gaine*) (*Schacht*) : The space in which the car, the counterweight or the balancing weight travels. This space is usually bounded by the bottom of the pit, the walls and the ceiling of the well.

AMERICAN NATIONAL STANDARD  
SAFETY CODE FOR

Elevators,  
Dumbwaiters,  
Escalators  
and  
Moving Walks

*Includes:*

ANSI A17.1a-1972  
ANSI A17.1b-1973  
ANSI A17.1c-1974  
ANSI A17.1d-1975  
ANSI A17.1e-1975  
ANSI A17.1f-1975  
ANSI A17.1g-1976

Covering their design,  
construction, installation,  
operation, inspection, testing,  
maintenance, alteration and repair.

ANSI A17.1-1971

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## SPECIAL CODE FOR ELEVATORS

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*Leveling Device, Two-Way Automatic Non-Maintaining.* A device which corrects the car level on both under-run and over-run, but will not maintain the level during loading and unloading.

*Leveling Zone.* The limited distance above or below an elevator landing within which the leveling device is permitted to cause movement of the car toward the landing.

*Machine, Driving.* The power unit which applies the energy necessary to raise and lower an elevator or dumbwaiter car or to drive an escalator, a private residence inclined lift or a moving walk.

*Electric Driving Machine.* One where the energy is applied by an electric motor. It includes the motor and brake and the driving sheave or drum together with its connecting gearing, belt or chain if any.

*Direct-Drive Machine.* An electric driving machine the motor of which is directly connected mechanically to the driving sheave, drum, or shaft without the use of belts or chains either with or without intermediate gears.

*Geared-Drive Machine.* A direct-drive machine in which the energy is transmitted from the motor to the driving sheave, drum, or shaft through gearing.

*Traction Machine.* A direct-drive machine in which the motion of a car is obtained through friction between the suspension ropes and a traction sheave.

*Geared-Traction Machine.* A geared-drive traction machine.

*Gearless-Traction Machine.* A traction machine, without intermediate gearing, which has the traction sheave and the brake drum mounted directly on the motor shaft.

*Winding-Drum Machine.* A geared-drive machine in which the hoisting ropes are fastened to and wind on a drum.

*Worm-Geared Machine.* A direct-drive machine in which the energy from the motor is transmitted to the driving sheave or drum through worm gearing.

*Indirect-Drive Machine.* An electric driving machine, the motor of which is connected indirectly to the driving sheave, drum or shaft by means of a belt or chain through intermediate gears.

*Belt-Drive Machine.* An indirect-drive machine having a single belt or multiple belts as the connecting means.

*Chain-Drive Machine.* An indirect-drive machine having a chain as the connecting means.

*Hydraulic Driving Machine.* One in which the energy is applied by means of a liquid under pressure in a cylinder equipped with a plunger or piston.

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*Direct-Plunger Driving Machine.* One in which the energy is applied by a plunger or piston directly attached to the car frame or platform and which operates in a cylinder under hydraulic pressure. It includes the cylinder and plunger or piston.

*Roped-Hydraulic Driving Machine.* One in which the energy is applied by a piston, connected to the car with wire ropes, which operates in a cylinder under hydraulic pressure. It includes the cylinder, the piston, and multiplying sheaves if any and their guides.

*Screw Machine.* An electric driving machine, the motor of which raises and lowers a vertical screw through a nut, with or without suitable gearing, and in which the upper end of the screw is connected directly to the car frame or platform. The machine may be of direct or indirect drive type.

May. The term "may" where used shall be construed as permissive.

*Moving Walk.* A type of passenger-carrying device on which passengers stand or walk, and in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted.

*Moving Walk, Belt Type.* A moving walk with a power-driven continuous belt treadway.

*Moving Walk, Belt Pulley Type.* A moving walk with a series of connected and power-driven pulleys to which a continuous belt treadway is fastened.

*Moving Walk, Pulley Type.* A moving walk with a series of connected and power-driven pulleys which together constitute the treadway.

*Moving Walk, Edge Supported Belt Type.* A moving walk with the treadway supported near its edges by a succession of rollers.

*Moving Walk, Roller Bed Type.* A moving walk with the treadway supported throughout its width by a succession of rollers.

*Moving Walk, Stiller-Bed Type.* A moving walk with the treadway sliding upon a supporting surface.

*Moving Walk System.* A series of moving walks in end to end or side by side relationship with no landings between treadways.

*Non-Stop Switch, Elevator.* A switch, which when operated, will prevent the elevator from making registered landing stops.

*Operating Device.* The car switch, push button, lever or other manual device used to actuate the control.

*Operation.* The method of actuating the control.

*Operation, Automatic.* Operation wherein the starting of the elevator car is effected in response to the momentary actuation of

## SECTION 3

ASME A17.1a-1997

hoistway-door locking device which permits egress from the hoistway side

*landing, top terminal* — the highest landing served by the elevator or material lift which is equipped with a hoistway door provided with a hoistway-door locking device which permits egress from the hoistway side

*landing, unenclosed* — a landing which is open to the atmosphere or is open to an interior court of a building

*landing, escalator or moving walk* — the stationary area at the entrance to or exit from an escalator, a moving walk, or moving walk system

*landing zone* — a zone extending from a point 18 in. (457 mm) below an elevator or material lift landing to a point 18 in. (457 mm) above the landing

*leveling* — controlled car movement toward the landing, within the leveling zone, by means of a leveling device, which vertically aligns the car-platform sill relative to the hoistway-landing sill to attain a predetermined accuracy

*leveling device, elevator car* — any mechanism which will, either automatically or under the control of the attendant, move the car within the leveling zone toward the landing only, and automatically stop it at the landing

NOTES (leveling device, elevator car):

- (1) Where controlled by the attendant by means of up-and-down continuous-pressure switches in the car, this device is known as an "inching device."
- (2) Where used with a hydraulic elevator to correct automatically a change in car level caused by leakage in the hydraulic system, this device is known as an "anti-creep device."

*leveling device, one-way automatic* — a device which corrects the car level only in case of under-run of the car, but will not maintain the level during loading and unloading

*leveling device, two-way automatic maintaining* — a device which corrects the car level on both under-run and over-run, and maintains the level during loading and unloading

*leveling device, two-way automatic nonmaintaining* — a device which corrects the car level on both under-run and over-run, but will not maintain the level during loading and unloading

*leveling zone* — the limited distance above or below an elevator or material lift landing within which the leveling device is permitted to cause movement of the car toward the landing

*listed* — equipment or materials included in a list published by an independent certifying organization concerned with product evaluation that maintains

periodic inspection of production of listed equipment or materials and whose listing states whether that equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner

NOTE (listed): The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction utilizes the system employed by the listing organization to identify a listed product.

*machine, driving* — the power unit which applies the energy necessary to drive an elevator or other equipment covered by the scope of this Code

*electric driving machine* — one where the energy is applied by an electric motor. It includes the motor, brake, and the driving sheave or drum together with its connecting gearing, belt, or chain, if any.

*direct-drive machine* — an electric driving machine, the motor of which is directly connected mechanically to the driving sheave, drum, or shaft without the use of belts or chains, either with or without intermediate gears

*geared-drive machine* — a direct-drive machine in which the energy is transmitted from the motor to the driving sheave, drum, or shaft through gearing

*winding drum machine* — a geared-drive machine in which the suspension ropes are fastened to and wind on a drum

*traction machine* — a direct-drive machine in which the motion of a car is obtained through friction between the suspension ropes and a traction sheave

*geared-traction machine* — a geared-drive traction machine

*gearless-traction machine* — a traction machine, without intermediate gearing, which has the traction sheave and the brake drum mounted directly on the motor shaft

*worm-gear machine* — a direct-drive machine in which the energy from the motor is transmitted to the driving sheave or drum through worm gearing

*indirect-drive machine* — an electric driving machine, the motor of which is connected indirectly to the driving sheave, drum, gear reducer, or shaft by means of a belt drive or chain drive

*belt-drive machine* — an indirect-drive machine equipped with a belt system as the connecting means

*chain-drive machine* — an indirect-drive machine with a chain system as the connecting means

*rack and pinion driving machine* — an electric driving machine in which the motion of the car is obtained by power-driven rotating pinion(s) mounted on the car, traveling on a stationary rack mounted in the hoistway